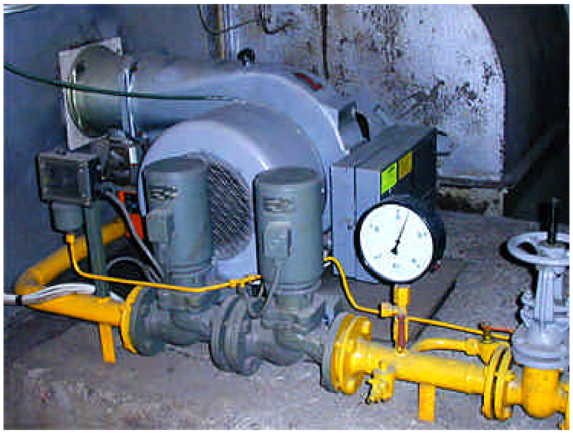
Modernizing Boiler Houses in Slovakia



Transferable Solution

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Project Title : Modernizing Boiler Houses in Slovakia
Leader: Terming, s.r.o. Bratislava, Slovakia
Partner: Honeywell, spol s.r.o. Prague, Czech Republic
Location: Bratislava, Slovakia
Project Duration: August 1999 – July 2000
EcoLinks Project Investment: Total Project Investment: $ 68,990; EcoLinks Grant Support: $ 48,175; Project Team Cost Share Contribution: $ 20,815.

Best Practice: Transferable Solution

Terming, a local utility company in Slovakia, was awarded an EcoLinks Challenge Grant to establish an interdisciplinary project team to assess the feasibility of modernizing boiler houses in Bratislava. The methodology applied in the project can be easily transferred to other utility companies that supply heating and hot water in the cities as well as water supply companies. The project is considered a Best Practice for a number of reasons including its high transferability. First, special attention was paid to involving different stakeholders on the team and providing transparency of project activities. For example, one of the team members was an NGO whose role was to develop a public information campaign. Second, the team developed a methodology for classifying and prioritizing different types of boiler houses for investment purposes. Third, prioritization of the boiler houses took into account the special historical status of the buildings and the limits on infrastructure development in the area. The special criteria for the unique location of the planned investment may be applied to other cities with historical buildings that have a diversified ownership structure. Fourth, a financial analysis and environmental impact assessment were completed, showing both the economic and environmental benefits of the project. The implementation of the project will result in annual cost savings of about $90,000 and reduced CO_2 emissions of 1,800 tons per year.

Project Summary

Terming, a local utility company largely owned by Old Town Bratislava, provides heating to the municipality from a number of gas-fired and coke-fired boilers. Old Town Bratislava is located in the central part of the city and has 346 gas-fired boilers that supply heating and hot water to the community. The boilers are obsolete and lack modern measurement and control systems causing excessive gas consumption. Some of the gas-fired boilers are 30-35 years old. The municipality and Terming are concerned about high-energy costs and air pollution. Local citizens have become increasingly dissatisfied with their rising heating bills and are concerned about infrastructure development in the historical town.

There are 146 gas-fired boiler houses with 346 boilers worth 60.2 MW of heat. Only 12 gas-fired boiler houses are equipped with modern combustion, measurement, and regulation systems. The remaining ones have limited, obsolete control equipment resulting in high gas consumption. The annual gas consumption is 8.4 million m^3, and the consumption per unit is 34.1 m^3 of gas per 1 GJ. Excessive energy combustion contributes to high CO_2 emissions (approx. 16,500 tons per year) and high thermal energy prices ($ 6.5 per 1 GJ). The higher prices are also partly due to the large number of employees necessary to manually control the systems.

Old Town Bratislava and Terming wanted to reduce gas consumption, leading to lower energy costs for both the municipality and consumers and at the same time to reduce air pollution. In addition, they wanted to involve the public to improve their image, and they wanted to take precautionary measures to protect the historical buildings in the community. With an EcoLinks Challenge Grant, they assembled a project team to assess the possibility of retrofitting 134 gas-fired boiler houses with modern measurement and control systems.The project team members were diverse and interdisciplinary.They each contributed different skills and resources, helping to enhance the credibility and transparency of the project.The implementation of the project will result in annual cost savings of about $90,000 and reduced CO_2 emissions of 1,800 tons per year.

Project Activities

1. Convened implementation team

Action: The project implementation team members were selected and convened. They represented a cross section of stakeholders. The project team was comprised of representatives from the following organizations:

1. Terming, the local utility company and operator of the heating systems, was represented by technical and economic experts who were involved at every stage of the project implementation
2. Honeywell Prague was the consulting company specializing in heat generation and distribution and automation and control systems. Its role was to design a uniform system of measurement and control elements that could be applied in the

Old Town's boiler houses, including remote communication with a central control room.

3. Municipality Bratislava Old Town, the majority owner of Terming, was responsible for supplying heat and hot tap water to the inhabitants.
4. Slovak Technical University, Department of Automated Control and Measurement at the Faculty of Mechanical Engineering, contributed experts to analyze the current condition of the heating systems and assess options for their modernization in cooperation with Honeywell.
5. Otvoreny Kruh (Open Circle) is a Slovak NGO whose role was to raise public awareness of the project and disseminate the results to the community.
6. Ecotoxicology Center, a laboratory in Bratislava, assessed the environmental impact of the prospective investment. It calculated the avoided emissions of different pollutants based on the different levels of gas consumption before and after the modernization of boiler houses.

Product(s): Interdisciplinary, multi-party project implementation team.

2. Conducted assessment of boiler houses

Action: All 134 boiler houses were carefully examined and basic data concerning the condition of existing equipment and operation costs were gathered. A database was created to present the gathered information in a comprehensive format. The database included information about heat production, hot tap water production, fuel consumption and cost, electricity and water consumption, salaries, insurance costs, costs of inspection certificates, overheads, depreciation, and other operation costs, such as maintenance costs, fines and fees for pollution. The data revealed not only that the unit gas consumption and operation costs were high in the investigated boiler houses, but also that the figures varied considerably from site to site. As expected, the boiler houses with limited or no measurement and control equipment had higher unit gas consumption and operation costs than the boiler houses with more sophisticated measurement and control systems. The data can serve many different purposes, such as an analysis of current operation costs or investment planning. The database will be regularly updated with new information.

Product(s): Development of a comprehensive and detailed database for existing gas-fired boiler houses.

3. Classified and prioritized boiler houses

Action: Based on an analysis of the information provided in the database, the boiler houses were classified into four different groups according to the amount of power installed in the boiler houses, the number of boilers, and their seasonal operation. Boilers designed to produce energy only for heating purposes operate in the cold winter months, while boilers that supply both heating and hot water operate year round. This classification helped to allocate resources in such a way to maximize energy savings with the minimal investment.

The boiler houses were classified into the following four groups:

1. Plants with the highest power installed, having more than one boiler, and producing both heating and hot tap water. They are operational the entire year, and they are targeted for connection to the central control system. The most complex measurement and control systems would be installed in this group.

2. Medium size units, generating both heating and hot tap water and being operational the entire year. Relatively sophisticated measurement and control equipment would be installed in these units.

3. Medium size boiler houses, generating only heating and being operational only during the heating season. The different capacity of each boiler would determine the selection of equipment in the future.

4. The smallest units, supplying heating to no more than two buildings. Only basic measurement and control equipment would be installed in these units.

As part of the priority-setting process, special considerations were taken into account for the boiler houses located near the historical buildings in Old Town. Construction is limited for particular buildings or areas, and in some cases modernization of the boiler houses would be complicated by the existing infrastructure. The team recommended modernizing 25 heating plants on a priority basis. The remaining plants would be modernized later when funding was secured and other problems were resolved, such as the ownership of the boiler houses and the necessary permits.

Product(s): 1) Classification of boilers 2) Boiler prioritization schema.

4. Prepared engineering designs

Action: A detailed engineering design for the installation of measurement and control equipment was prepared for a sample boiler house from each of the boiler categories.

Product(s): Technical documentation for each sample boiler house including a description of its present condition, a description of the new design, specification of the needed equipment, and a cost estimation.

5. Conducted economic and environmental assessment

Action: Based on the above technical evaluation, the necessary investment outlays, future operation costs, and other economic parameters were estimated. Different scenarios were prepared assuming stable fuel prices as well as a possible 20% increase in the price of gas. The environmental impact of the proposed investment was assessed, showing the lower emission levels of different pollutants that would result.

Product(s): 1) Investment structure 2) Environmental impacts statement.

6. Disseminated results

Action: The results of the project were disseminated to the community through an informational brochure and articles in local newspapers.

Product(s): 1) Information brochure 2) Publications in local newspapers.

Project Benefits

The project benefits are listed below emphasizing capacity building benefits including innovative teamwork experience, environmental benefits emphasizing a reduction in air pollutants, and economic benefits derived largely from energy efficiency.

Capacity Building Benefits

This project built a collaborative framework for addressing problems involving heat and hot water production and consumption, economic considerations, environmental protection, and development. Using this framework, the project team members gained critical experience working in an interdisciplinary context using an integrative approach to problem solving. The team members also established cross-sectoral relationships that are likely to encourage and benefit future efforts to address similar problems. The project's public awareness campaign on the economic and environmental issues related to district heating further enhanced the participatory capacity of the community in addressing similar problems.

Environmental Benefits

The environmental benefits of this project are reductions in air pollutants as outlined in Table 1. Environmental Benefits.

Air pollutants	Current emissions (t/year)	Expected reductions (t/year)
CO_2	16 500	1788.6
CO	5.3	0.6
SO_2	0.08	0.01
NO_x	13.1	1.42
Particulates	0.6	0.07

Table 1: Environmental Benefits

Economic Benefits

The project is estimated to reduce gas consumption by an average of 10.8%. The expected fuel savings range from 3 to 25 % depending on the boiler house. The total savings amount to 0.91 million m^3 of natural gas per year. This reduction will result in annual cost savings of $ 89,200.

Total project investment outlays amount to $ 310,000. The simple payback time of the investment varies from 1.7 to 9 years for each boiler house, with an average value of

4.25 years. If all boiler houses are equipped with measurement and control systems, the EcoLinks grant of approximately $ 48,000 will foster environmental investments amounting to $310,000.

Lessons Learned

The following lessons were learned during project implementation:

- It is important to involve different stakeholders when implementing similar projects. This can be achieved in two ways. First, the project team should represent different stakeholders. An ideal team might include the municipality, local utility, an independent consulting company or independent experts and a NGO. Second, a public information campaign should be developed to inform the community of the nature of the project and the problems it addresses, the on-going activities and the results. The public needs to understand both the economic and environmental consequences of the proposed project and have an opportunity to provide feedback.

- When developing an investment program in a city's historical center, many additional factors need to be considered, such as ownership of the site, its location in the historical center, any limits on construction, and the state of existing infrastructure.

- The critical factors for a successful project are clear and effective cooperation between project team members, well-defined goals and tasks, and realistic expectations.

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